National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

Heritage Adoption Lessons Learned: Cover Deployment and Latch Mechanism

38th Aerospace Mechanisms Symposium
Langley Research Center

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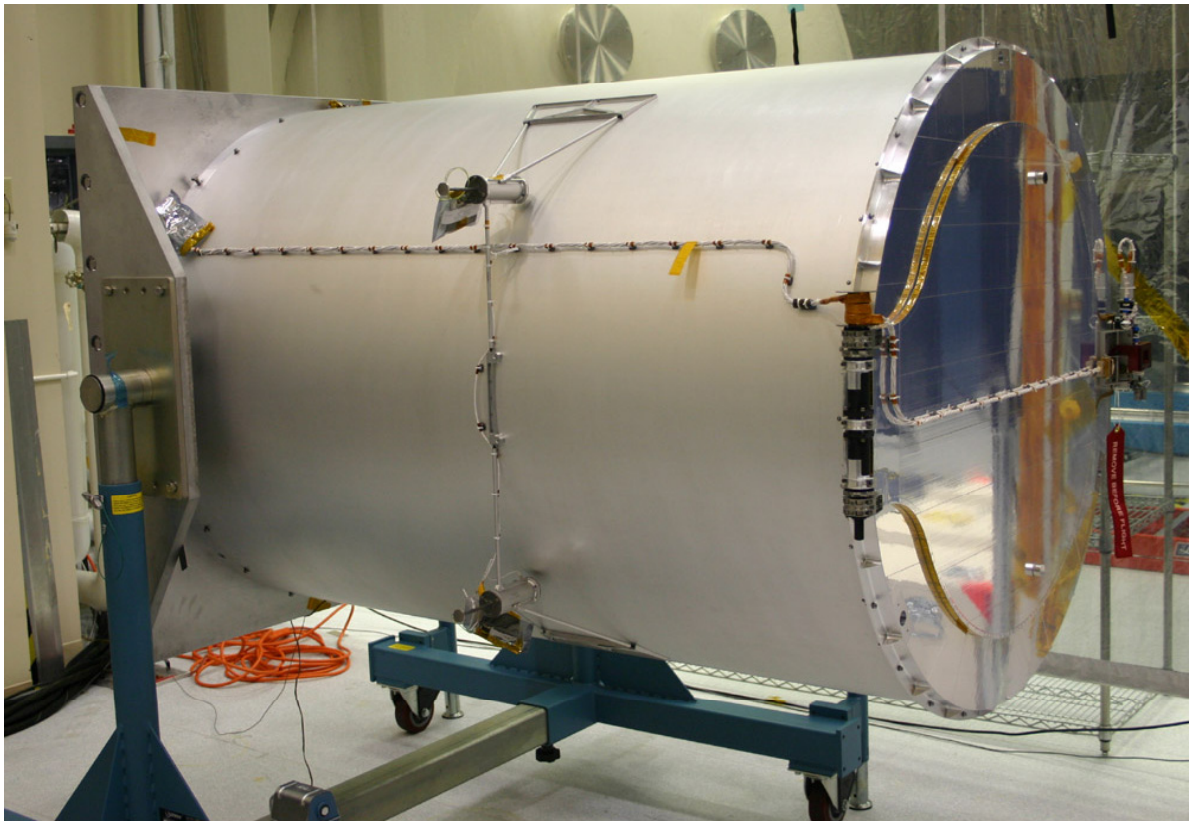
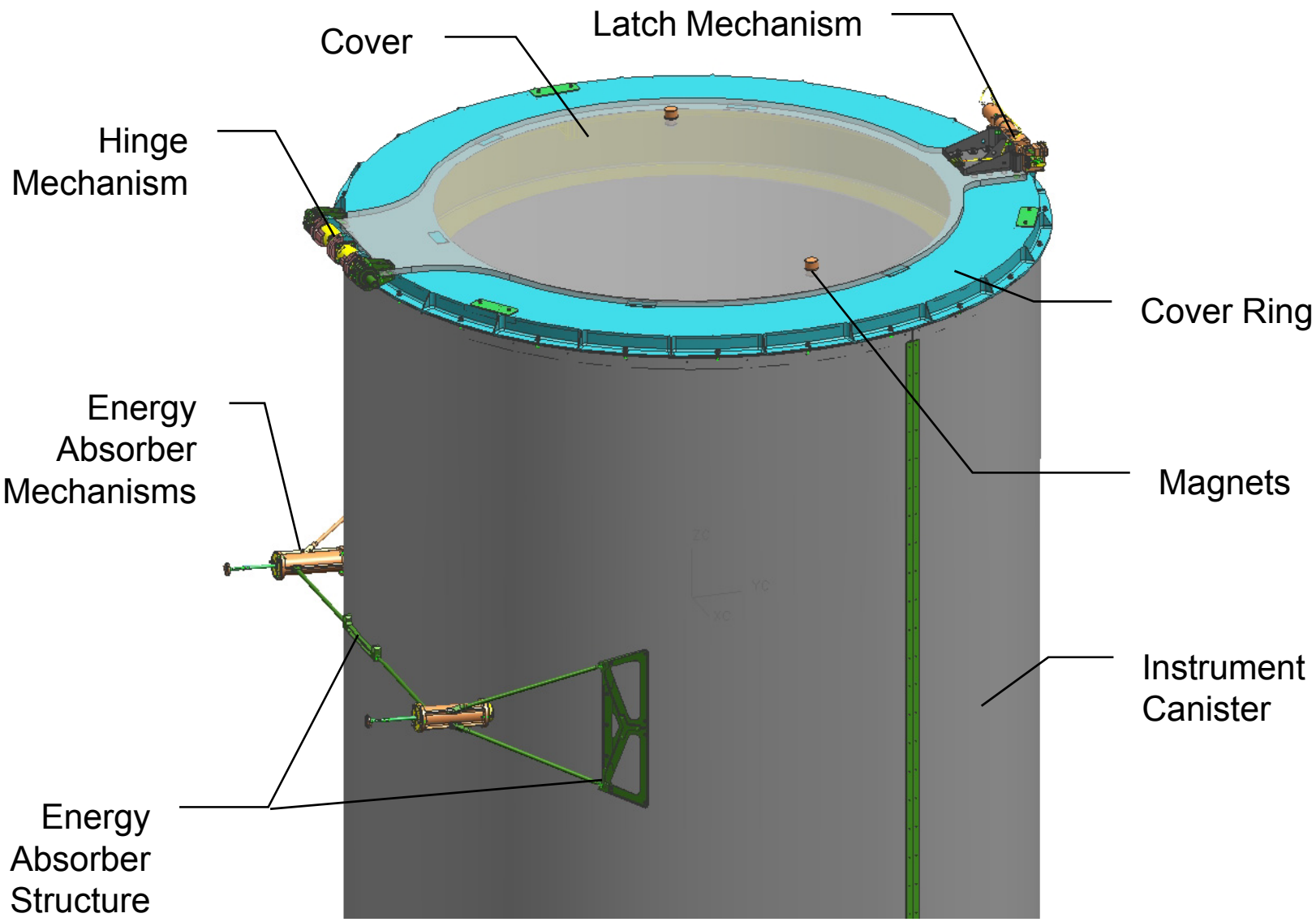
Agenda

- **Cover deployment hardware overview (brief)**
  - Three mechanisms – Latch, Hinge, Energy Absorbers (understand lessons learned better)
- **Heritage adoption lessons learned**
- **Test deployment video**



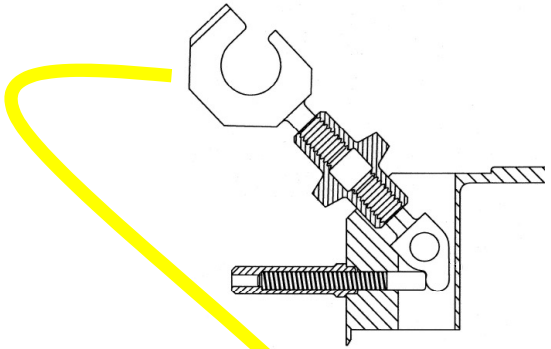
Overview

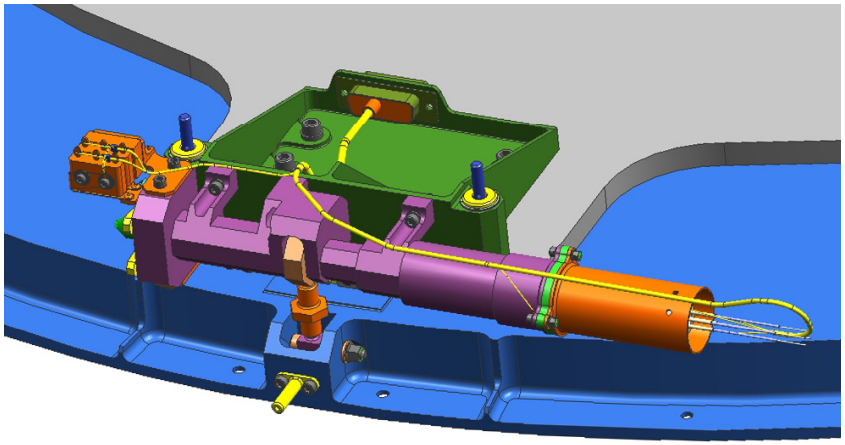

Cover
Latch Mechanism
Hinge Mechanism
Cover Ring
Energy Absorber Mechanisms
Magnets
Instrument Canister
Energy Absorber Structure

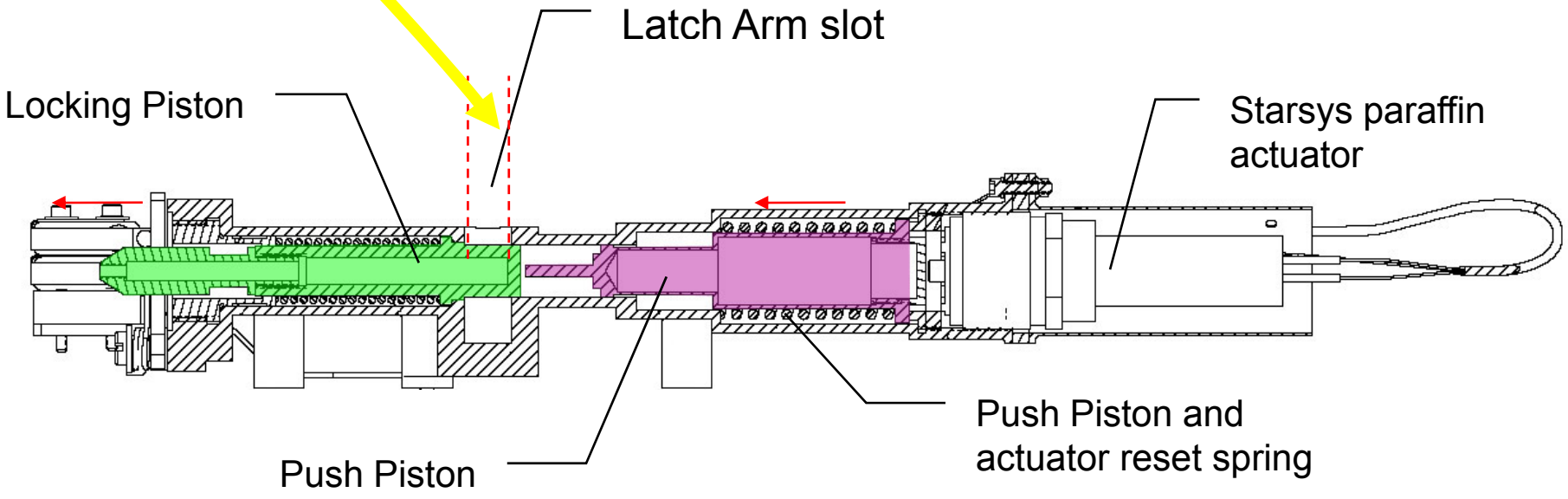
Overview

- **One time cover deployment**
- **Decision to fully adopt Galaxy Evolution Explorer (GALEX) cover deploy design**
  - Save cost and schedule
  - GALEX hardware successful
- **Roughly twice size of GALEX**

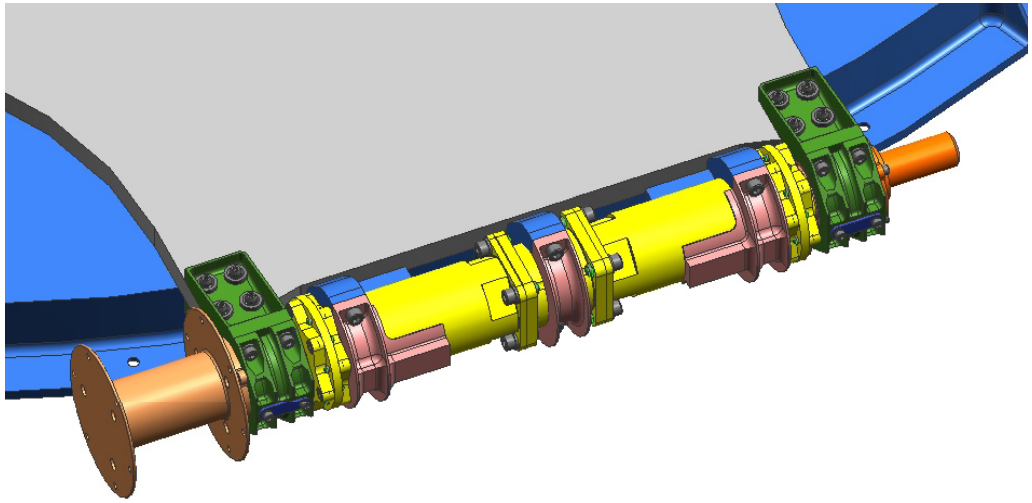
Latch Overview

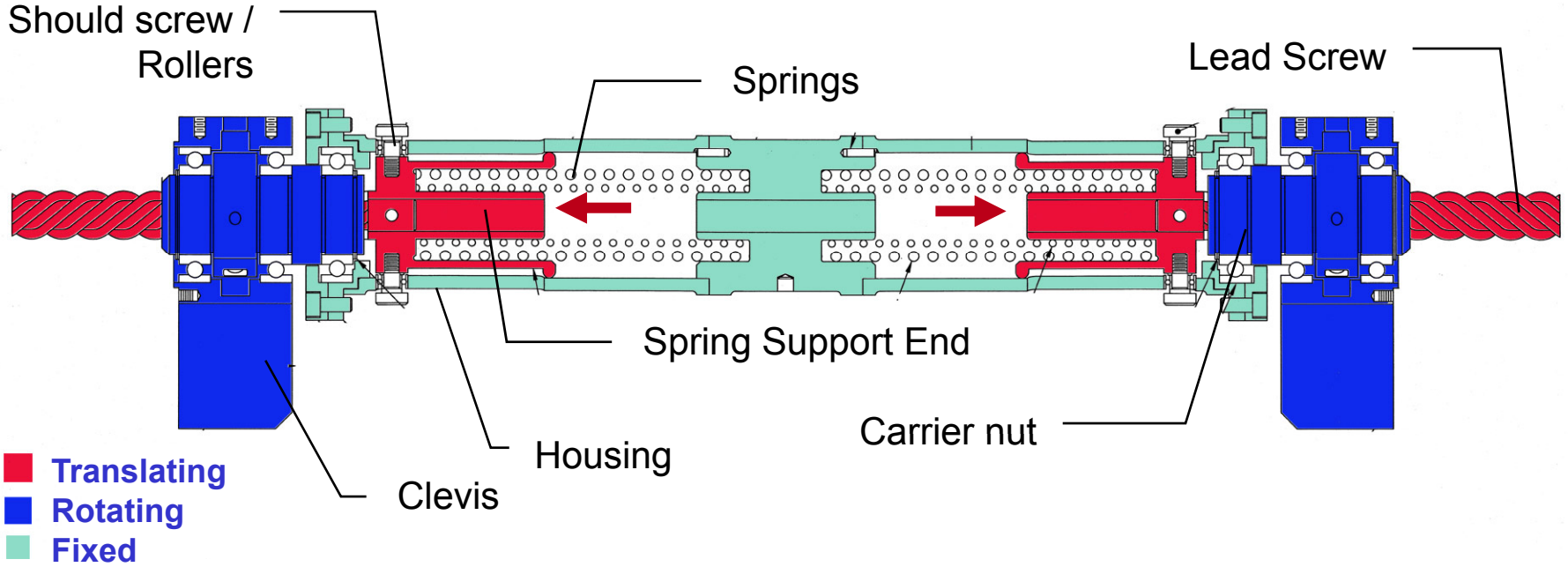






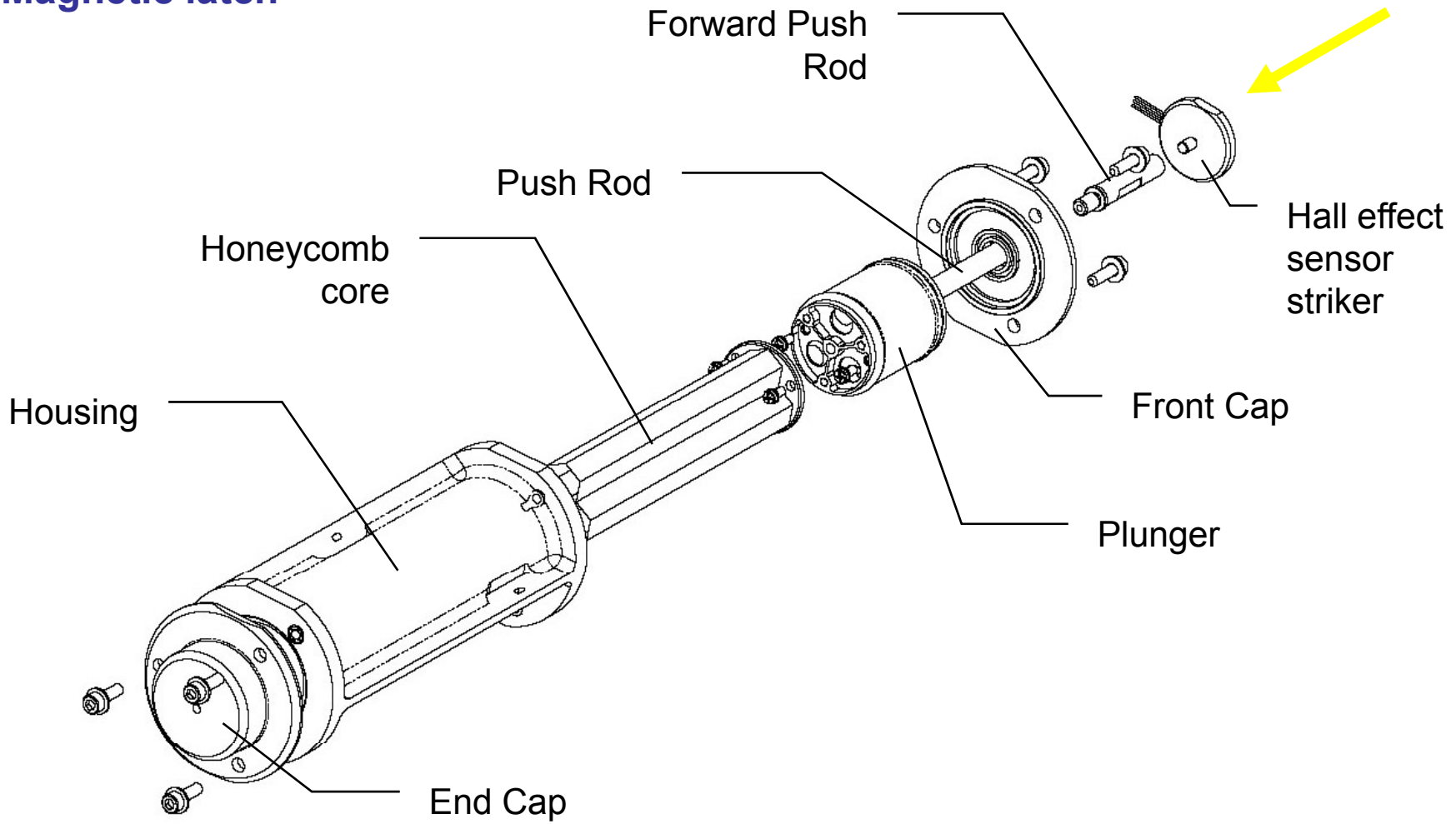
Hinge Overview





Energy Absorber

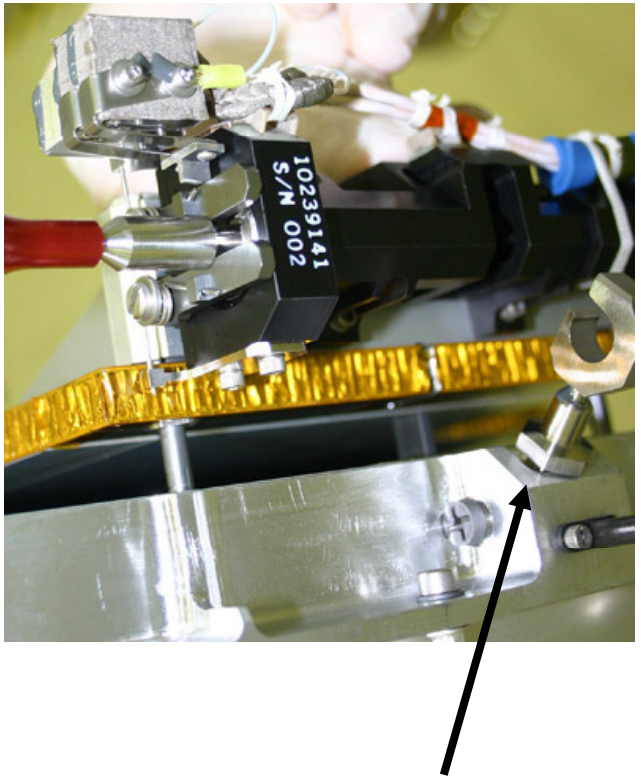
- **Crushable honeycomb**
- **Magnetic latch**



Lessons Learned

- **Heritage adoptions look attractive to save cost and schedule, *however***

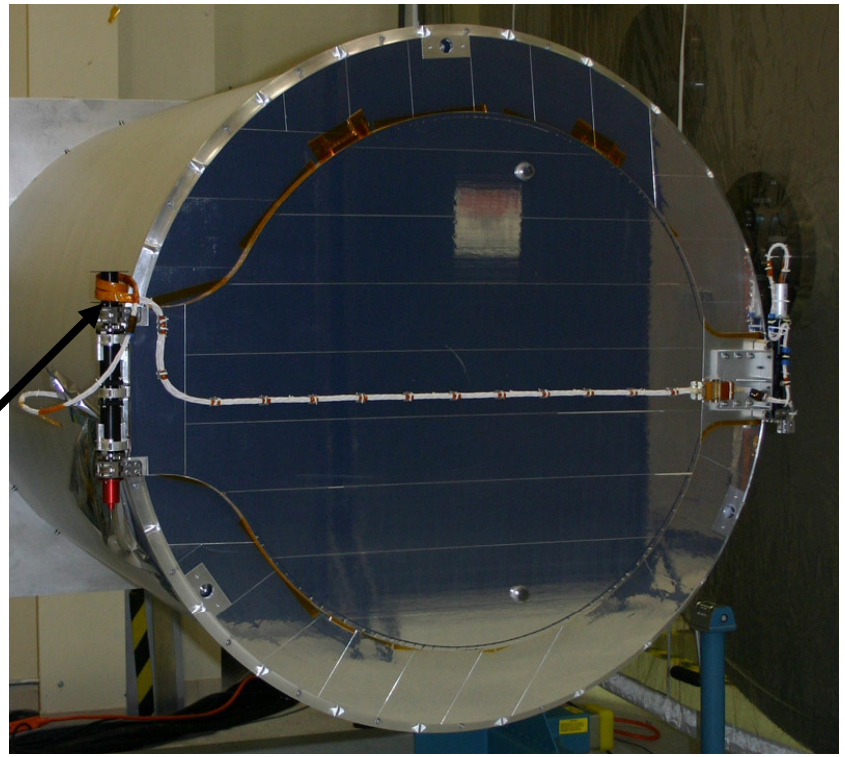
- **Heritage designs may impose unnecessary limitations**
  - GALEX rotated Latch Arm out of view
  - Not necessary in new design
  - Added complexity and potential failure mode to new design



- **Hinge limitations**
  - Early adoption of Hinge mechanism and cover limited Energy Absorber design
  - Un-dampened Hinge torque output had to be *increased* to sustain honeycomb crushing

Lessons Learned

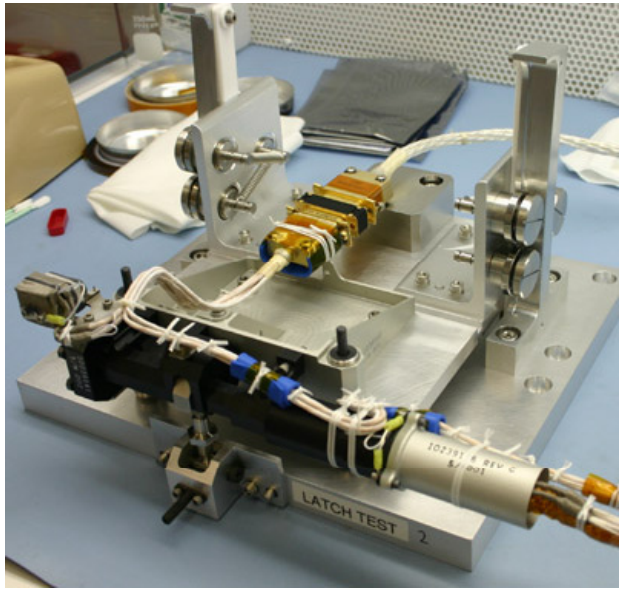
- **Heritage designs may impose unnecessary limitations**
  - Latch mechanism placement on cover dictated cable routing over hinge
  - New design would have allowed placement on cover ring instead



- **Perform trade studies of designs similar in function to that of the heritage hardware. Look for best solution.**
  - Example: Actuator redundancy

Lessons Learned

- **Thoroughly review heritage drawing package for completeness**
  - GALEX drawing package incomplete
  - Cost and schedule impact for corrections



- **Review heritage design for failure modes. It can not be assumed that all modes were found, or that new modes will not be introduced.**
  - Found Latch mechanism delayed release anomaly with new test fixture

- **Verify the heritage design will meet project requirements**
- **Review heritage test data and test plans and verify they meet current projects requirements. If they do not, study impact and feasibility of revised testing.**

Thermal Vacuum Test